41. (New) The leadframe of claim 37, wherein said first slot is between two pair of adjacent leads of increasing width, wherein each said pair includes one of the two leads defining the first slot, and wherein the two adjacent leads of each said pair define an open second slot between them, and each of the second slots has a width, and the width of the second slots each are less than the width of the first slot.

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42. (New) The leadframe of claim 37, wherein the first slot increases in width and then decreases in width from the frame toward the central region.

43. (New) The leadframe of claim 37, further comprising a short tapered metal first member integral with the first corner of the frame and extending into the first slot for only a portion of a length of the first slot.

REMARKS

Applicants thank the Examiner for attending to this case.

Applicants submit that the case is in a condition for allowance in view of the amendments provided above and in the drawings, and in view of the following remarks.

I. Drawings

Accompanying this Response to the Office Action dated May 9, 2001, is a Request To Amend Drawings, which addresses amendments in the drawings.

II. Specification

The above amendment amends the specification to correct errors and improve clarity. In particular, the amendment to the paragraph starting on page 1, line 22, was made to correctly refer to metal bond wires 3. The amendments to the paragraph starting on page 1, line 35, were made to correctly identify metal sheet 50'. The amendments to the paragraphs starting on page 2, line 10, and page 2, line 16, were made to refer to lower surface 5c'. The amendments to the paragraphs starting on page 3, line 8, and page 8, line 17, and to the abstract starting on page 14, line 10, were made to correct typographical errors.

The amendments to the paragraph starting on page 4, line 20, were made to improve clarity in the discussion of metal bond wires 3. The amendment to the paragraph starting on page 5, line 2, was made to correct a mathematical error. The amendments to the paragraphs

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starting on page 6, line 5, page 6, line 8, and page 6, line 13, were made to correctly refer to Figs. 5A, 5B, and 5C. The amendments to the paragraph starting on page 6, line 27, were made to correctly refer to upper surface 5a. The amendments to the paragraph starting on page 8, line 23, were made to correctly refer to Fig. 9A and 9B. The amendment to the paragraph starting on page 9, line 11, was made to improve clarity in the discussion of slot 18a. The amendments to the paragraph starting on page 9, line 21, were made to correctly refer to spade-shaped portion 15c. None of the above amendments add new matter.

III. Claims

Claims 1-20 were pending in the above-identified application when last examined. Claims 1, 6, 7, 10, 12, 16, 17, and 20 are amended as indicated above. Claims 4, 5, 8, 9, and 15 are canceled. Claims 21-43 are added.

A. Claim Amendments

Claim 1 is amended to incorporate the limitation of original Claim 5.

Claims 6 and 7 are amended to correct the claim dependencies in light of the cancellation of original Claim 5 and the incorporation of original Claim 5 into Claim 1.

Claim 10 is amended to conform to the language of amended Claim 1. This amendment does not affect the scope of the claim.

Claim 12 is amended to further specify the metal leads. Support for the amendment is given in the paragraph starting on page 9, line 25. Claim 12 is also amended to further specify the metal plate.

Claim 16 is amended to broaden the claim language.

Claim 17 is amended to correct a typographical error. This amendment does not affect the scope of the claim.

Claim 20 is amended to conform to the language of amended Claim 12. This amendment does not affect the scope of the claim.

B. Claim Rejections under 35 U.S.C. § 102

Claims 1-3, 5-7, 9, and 11 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,783,860 issued to Jian Dih Jeng and Hsing Seng Wang (hereinafter, "Jeng et al."). Applicants respectfully traverse the rejections.

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1. Claim 1

The Examiner states "Jeng disclose heat sink bonded to a die paddle having at least one aperture with (1) A semiconductor package comprising: a semiconductor chip (58); a package body (50) formed of a hardened encapsulant material (78); metal leads (52), wherein each lead is electrically connected to the chip; a flat plate fully encapsulated within said package body (50), wherein the chip (58) is mounted on the plate and an encapsulated first portion of each of the leads overhangs a periphery of the plate (note columns 4 and 5 lines 63-67 and 1-11, respectively. Figure 4)." The Examiner also states that Jeng et al. discloses "(5) wherein the plate is metal (64), and further comprising a plurality of electrically isolated, encapsulated members; wherein each said member extends from an edge of the package body toward said plate (64) and overhangs the periphery of the plate; wherein said metal plate is a connection with each said member (note Figure 4)."

Applicants submit that Jeng et al. does not disclose "a flat metal plate fully encapsulated within said package body, wherein the chip is mounted on the plate," as recited by Applicants' amended Claim 1. The Examiner has identified heat sink 64 of Jeng et al. as a "plate." As shown in Fig. 4 of Jeng et al., die 58 is mounted on die paddle 54, not heat sink 64.

Further, Applicants submit that Jeng et al. does not disclose "an encapsulated first portion of each of the leads overhangs a periphery of the plate", as recited by Applicants' amended Claim 1. As shown in Fig. 4 of Jeng et al., leads 52 do not overhang heat sink 64 or die paddle 54.

Further, Applicants submit that Jeng et al. does not disclose "a plurality of electrically isolated, encapsulated members, wherein each said member extends from a perimeter of the package body toward the plate and overhangs the periphery of the plate and is in a connection with the plate," as recited by Applicants' amended Claim 1. As shown in Fig. 4a of Jeng et al., tie bars 56 are integrally coupled to metal die paddle 54. Since tie bars 56 are integrally coupled to the edge of die paddle 54, they do not "overhang[s] the periphery" of heat sink 64 or of die paddle 54, as shown in Figs. 4 and 4a of Jeng et al.

Modifying Jeng et al. to meet the limitations of Applicants' amended Claim 1 is not suggested in Jeng et al. Applicants therefore respectfully submit that amended Claim 1 is allowable over Jeng et al.

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2. Claims 2-3, 6-7, and 11

Claims 2-3, 6-7, and 11 depend from Claim 1 and should be allowed for at least the same reasons as Claim 1.

Further, regarding the limitation of Claim 2, the Examiner states Jeng et al. discloses "wherein the plate is comprised of copper and has a CuO or Cu2O film on all surfaces thereof (note column 5 lines 7-10)." In col. 5, lines 7-10, Jeng et al. refers to copper heat sinks. Applicants respectfully submit, however, that Jeng et al. does not disclose "wherein the plate is comprised of copper and has a CuO or Cu_20 film on all surfaces thereof," as recited in Applicants' Claim 2 and discussed in the paragraph starting on page 6, line 17.

Further, regarding the limitation of Claim 3, the Examiner states Jeng et al. discloses "wherein an electrically insulative, thermally conductive adhesive layer (70) is attached between the first portion of the leads and the plate, and said layer is covered by said encapsulant material (78) (note Figure 1)." Applicants respectfully disagree. As stated in col. 2, lines 2-3, Figure 1 of Jeng et al. shows a "[p]olyimide tape 10 securely bonds die paddle 12 to heat sink 14." Die paddle 12 is not a lead, and thus Jeng et al. does not disclose an "adhesive layer is attached between the first portion of the leads and the plate," as recited by Applicants' Claim 3.

Further, regarding the limitation of Claim 7, the Examiner states Jeng et al. discloses "wherein the metal plate (64) is connected to said members by an electrically insulative, thermally conductive adhesive layer (70) (note column 5 lines 29-31. Figure 4)." Applicants respectfully disagree. As seen in Fig. 4 and stated in col. 5, lines 29-31, of Jeng et al., "die 58 and the heat sink 64 are bonded together with the die paddle 54 sandwiched therein between by an adhesive 70." Jeng et al.'s heat sink 64 is connected to die 58 and die paddle 54, but heat sink 64 is not connected to any "members." Thus, Jeng et al. does not disclose the "metal plate is connected to said members by an electrically insulative, thermally conductive adhesive layer," as recited by Applicants amended Claim 7.

Further, regarding the limitation of Claim 11, the Examiner states Jeng et al. discloses "wherein the encapsulant material is between said plate and the first portion of the leads (note Figure 4)." Applicants respectfully disagree. As discussed above with reference to Claim 1, Jeng et al. does not disclose a "first portion of each of the leads overhangs a periphery of the plate." Since there are no "first portions," Fig. 4 does not show encapsulant material is "between said plate and the first portion of the leads," as recited by Applicants' Claim 11.

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For the above reasons, Applicants request reconsideration and withdrawal of the rejections under 35 U.S.C. § 102, with respect to Claims 1-3, 6-7, and 11.

C. Claim Rejections under 35 U.S.C. § 103

1. Claim 10

Claim 10 was rejected under 35 U.S.C. § 103(a) as unpatentable over Jeng et al. Applicants respectfully traverse the rejection.

As discussed above with reference to the § 102 rejection, Applicants' amended Claim 1 is patentable over Jeng et al. Claim 10 depends from Claim 1 and should be allowed for at least the same reasons as Claim 1.

Applicants therefore respectfully submit that Claim 10 is allowable over Jeng et al.

For the above reasons, Applicants request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103.

D. Claim Rejections under 35 U.S.C. § 102

Claims 12-14 and 16-19 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,650,663 issued to Arvind Parthasarathi (hereinafter, "Parthasarathi"). Applicants respectfully traverse the rejections.

1. Claim 12

The Examiner states "Parthasarathi discloses a electronic package with improved thermal properties by (12) A leadframe comprising: a metal frame (16) including a central region within the frame; a plurality of metal leads (18) extending from a first end integral with the frame (16) to a second end adjacent to the central region; a flat plate supported in the central region, wherein a first portion of each said lead overhangs a peripheral edge of the said plate."

Applicants submit that Parthasarathi does not disclose the leadframe recited in Applicants' amended Claim 12. In particular, Applicants' Claim 12 is amended to recite "wherein at least a plurality of the leads increase in width as those leads extend from the frame toward the central region." Support for the amendment to Claim 12 is given in the paragraph starting on page 9, line 25. This feature of Claim 12 is not suggested in Parthasarathi.

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Modifying Parthasarathi to meet the limitations of Applicants' amended Claim 12 is also not suggested in Parthasarthi. Applicants therefore respectfully submit that amended Claim 12 is allowable over Parthasarathi.

2. Claims 13-14 and 16-19

Claims 13-14 and 16-19 depend from Claim 12 and should be allowed for at least the same reasons as Claim 12.

Further, regarding the limitation of Claim 16, the Examiner states Parthasarthi discloses a package with a leadframe "further comprising a plurality of electrically isolated members extending from said frame adjacent to said leads; wherein each said member overhangs the periphery of the plate and is in a connection with said plate (note column 2 lines 37-44)." Applicants respectfully disagree with Examiners' argument. Col. 2, lines 37-44, of Parthasarathi states "the end portion of the inner end 20 of the leads 18 is connected to the periphery of the upper surface 28 of the heat slug 12...." Applicants' Claim 12 recites "a plurality of metal leads." Applicants' Claim 16, which depends from Claim 12, recites "further comprising a plurality of members extending from said frame adjacent to said leads." The "members" recited in Applicants' Claim 16 are thus separate entities from the "leads," and Parthasarathi does not disclose any such "members."

Further, regarding the limitation of Claim 17, the Examiner states that Parthasarathi discloses "wherein each said member extends from [a corner] of said frame (note Figure 1)." Applicants respectfully disagree. As discussed previously with reference to Claim 16, Parthasarathi does not disclose the "members" recited by Applicants' Claim 16. Applicants' Claim 17 depends from Claim 16. Since Parthasarathi does not disclose the "members" recited by Applicants' Claim 16, Figure 1 of Parthasarathi does not show "wherein each said member extends from a corner of said frame," as recited by Applicants' amended Claim 17.

Further, regarding the limitation of Claim 18, the Examiner states that Parthasarathi discloses "wherein the metal plate is connected to said members by an electrically insulative, thermally conductive adhesive layer (note column 2 lines 27-29)." Applicants respectfully disagree. As discussed previously with reference to Claim 16, Parthasarathi does not disclose the "members" recited by Applicants' Claim 16. Applicants' Claim 18 depends from Claim 16. Col. 2, lines 27-29, of Parthasarathi states "[a] suitable adhesive or die attach 26 bonds the electronic device 14 to the top surface 28 of heat slug 12 as shown." Thus, Parthasarathi

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does not disclose "wherein the metal plate is connected to said members by an electrically insulative, thermally conductive adhesive layer," as recited by Applicants' Claim 18.

Further, regarding the limitation of Claim 19, the Examiner states that Parthasarathi discloses "wherein each connection is a metal to metal connection between the plate and the respective member (note column 2 lines 53-59)." Applicants respectfully disagree. As discussed previously with reference to Claim 16, Parthasarathi does not disclose the "members" recited by Applicants' Claim 16. Applicants' Claim 19 depends from Claim 16. Col. 2, lines 53-59, of Parthasarathi refers to the material that can be used for "lead frame 24" and the materials for "a plating thereon." No mention is made of the "members," or the "plate," or a "connection" between them. Thus, this cite has no bearing on Applicants' Claim 19, and Parthasarathi does not disclose "wherein each connection is a metal to metal connection between the plate and the respective member," as recited by Applicants' Claim 19.

For the above reasons, Applicants request reconsideration and withdrawal of the rejections under 35 U.S.C. § 102.

E. Claim Rejections under 35 U.S.C. § 103

1. Claim 20

Claim 20 was rejected under 35 U.S.C. § 103(a) as unpatentable over Parthasarathi. Applicants respectfully traverse the rejection.

As discussed above with reference to the § 102 rejection, Applicants' Claim 12 is patentable over Parthasarathi. Claim 20 ultimately depends from Claim 12 and should be allowed for at least the same reasons as Claim 12.

Applicants therefore respectfully submit that Claim 20 is allowable over Parthasarathi.

For the above reasons, Applicants request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103.

F. Claim Additions

New Claims 21-43 are added.

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CONCLUSION

In summary, Claims 1-20 were pending in the application. This response amends Claims 1, 6, 7, 10, 12, 16, 17, and 20; cancels Claims 4, 5, 8, 9, and 15; and adds Claims 21-43. For the above reasons, Applicants respectfully request allowance of Claims 1-3, 6-7, 10-14, and 16-43. Should the Examiner have any questions concerning this response, the Examiner is invited to call the undersigned at (408) 453-9200.

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ATTACHMENT A

In the following, insertions are underlined, and deletions are enclosed in brackets.

The paragraph starting on page 1, line 22, is amended as follows.

Fig. 1 is a cross-sectional view of a conventional semiconductor package 1'. Package 1' includes a semiconductor chip 2 that is attached to a planar upper surface 5a of a heat sink 5' using adhesive 6. Heat sink 5' has a relatively large thickness (e.g., 1 to 3 mm) and may be formed of copper, aluminum, or other materials. A plurality of metal leads 7' surround semiconductor chip 2. Leads 7' are about 0.12 mm to 0.15 mm thick, and thus are much thinner than heat sink 5'. Each lead 7' comprises an encapsulated inner lead 11' and a nonencapsulated outer lead 12'. The inner leads 11' overlap heat sink 5', but are electrically isolated from heat sink 5' by a dielectric material, e.g., a layer of an adhesive tape 6a. Metal bond wires 3 electrically connect each inner lead 11' to a bond pad of semiconductor chip 2. An insulative, molded resin encapsulate 4 forms the package body and covers semiconductor chip 2, inner leads 11', conductive metal bond wires 3, and upper surface 5a' and side surfaces 5b' of heat sink 5'. Planar lower surface 5c' of heat sink 5' is exposed at the lower surface of the resin encapsulate 4 in order to obtain improved heat discharge characteristics.

The paragraph starting on page 1, line 35, is amended as follows.

Fig. 2 illustrates a conventional procedure for fabricating a conventional heat sink 5'. In particular, a pair of facing U-shaped slots 51' are stamped through a metal [strip] sheet 50'. A pair of opposing support bars 52' remain after slots 51' are stamped. Subsequently, support bars 52' are cut in a second stamping step. Since the support bars 52' are relatively thick, some elongation of support bars 52' occurs during the cutting operation. As a result, V-shaped protrusions 8 are formed on two opposing sides of heat sink 5'. This two step stamping process is used because of the substantial thickness of metal [strip] sheet 50' and support bars 52'. If a single stamping step were used instead, heat sink 5' would be bent. Consequently, an additional step to flatten heat sink 5' would be required.

The paragraph starting on page 2, line 10, is amended as follows.

After heat sink 5' is cut from metal sheet 50', heat sink 5' typically is subjected to several complicated coating and treatment steps. For example, the exposed lower surface 5c'

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of heat sink 5' (Fig. 1) typically is sand blasted to facilitate marking and then plated with nickel. The encapsulated surfaces of a copper heat sink 5' are subjected to a well-known black oxidation process (adapted to form a CuO thin film and/or a Cu_20 thin film) that facilitates the attachment of encapsulate 4 to heat sink 5'.

The paragraph starting on page 2, line 16, is amended as follows.

Conventional heat sink 5' of package 1' and the methods used to make heat sink 5' have several disadvantages. First, as described above, heat sink 5' is too thick to be stamped out in a single stamping step, but rather requires two stamping steps. Second, because lower surface 5c' of heat sink 5' is exposed at the lower surface of the package body, the complicated nickel coating and sand blasting steps described above are necessary. Third, protrusions 8 on heat sink 5' cause turbulence in the flow of resin during the molding process, and possibly can cause the formation of undesirable voids in encapsulate 4. Fourth, because heat sink 5' is heavy, and is much thicker than inner leads 11', inner leads 11' may become bent during handling of the leadframe after heat sink 5' is attached thereto. Such a bend in the leads may cause short circuiting and may adversely affect wire bonding. Fifth, because [the] lower surface 5c' of heat sink 5' is exposed, a more complicated mold is required than would be used for an ordinary leadframe that does not have an exposed heat sink. Finally, excess encapsulate flashes onto lower surface 5c' of heat sink 5' during molding. Accordingly, a deflash step is necessary to remove the excess molding compound. This deflash process typically includes a chemical deflash step, followed by a mechanical deflash step using a water jet rinse.

The paragraph starting on page 3, line 8, is amended as follows.

One embodiment of a semiconductor package within the present invention includes a semiconductor chip encapsulated within a 28 mm square molded package body. The semiconductor chip is mounted on a fully encapsulated, flat plate (i.e., the heat sink), which may be formed of copper or other materials. Metal leads, which are much thinner than the plate, extend from a first end overhanging the plate within the package body to a second end outside of the package body. The plate may be [adhesivly] adhesively attached to the inner ends of the leads with an electrically insulative, thermally conductive adhesive tape, or staked

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to pseudo tie bars that extend from the corners of the package. The package may be used for high power applications that require excellent heat dissipation characteristics.

The paragraph starting on page 4, line 20, is amended as follows.

Package 1 of Fig. 3 includes a semiconductor chip 2 that is centrally mounted on a planar upper surface 5a of an encapsulated metal plate, denoted as heat sink 5. A thermally conductive adhesive 6, which may be a film or a paste, attaches chip 2 to upper surface 5a of heat sink 5. A plurality of metal leads 7 each extend from an encapsulated first end that is adjacent to chip 2 to a second end that is outside of the package body formed by encapsulate 4. In particular, each lead 7 comprises an encapsulated inner lead 11 and an exposed outer lead 12. Inner leads 11 extend over and are attached to an outer peripheral portion of upper surface 5a of heat sink 5 by means of an electrically insulative, thermally conductive adhesive layer 6a comprised of, for example, a double-sided adhesive tape. A plurality of metal bond wires 3 each electrically connect an inner lead 11 to a bond pad [pads] of semiconductor chip 2. A resin encapsulate 4 forms a package body. Encapsulate 4 completely covers chip 2, bond wires 3, heat sink 5, and inner leads 11.

The paragraph starting on page 5, line 2, is amended as follows.

Heat sink 5 may be formed of a variety of materials, such as copper, anodized aluminum, or ceramic (e.g., aluminum nitride). In view of experiments discussed below, a copper heat sink 5 for a 28 mm square high power package may have a thickness between upper surface 5a and lower surface 5c of 0.3 mm to 0.7 mm (e.g., about 0.5 mm). By contrast, copper leads 7 and conventional encapsulated die paddles (which are not heat sinks) typically have a thickness of about 0.12 mm to 0.15 mm. Thus, in this embodiment, heat sink 5 is two to [4.6] 5.8 times thicker than leads 7.

The paragraph starting on page 6, line 5, is amended as follows.

[Fig. 5a] Fig. 5A is a schematic view illustrating a procedure for fabricating a heat sink 5 according to one embodiment of the present invention. [Fig. 5b] Fig. 5B provides a side view of heat sink 5. [Fig. 5c] Fig. 5C is an enlarged view of portion D of [Fig. 5b] Fig. 5B.

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The paragraph starting on page 6, line 8, is amended as follows.

As shown in [Figs. 5a to 5c] Figs. 5A to 5C, heat sink 5 is fabricated in a single stamping step by stamping a square loop slot 51 through a metal sheet 50 having a thickness of 0.3 to 0.7 mm, e.g., 0.5 mm. Heat sink 5 may be stamped in one step, as opposing to the two stamping steps required to form heat sink 5' of Fig. 1, because metal sheet 50 of [Fig. 5a] Fig. 5A is significantly thinner than metal sheet 50' of Fig. 2 (0.3 to 0.7 mm verses 1.0 to 3.0 mm).

The paragraph starting on page 6, line 13, is amended as follows.

When heat sink 5 is downwardly punched from metal sheet 50, downward-extending burrs 9 [(Fig. 5c)] (Fig. 5C) may be formed at the edge of lower surface 5c of heat sink 5. To avoid tears in adhesive layer 6a of package 1 of Fig. 3, upper surface 5a of heat sink 5 opposite burrs 9 should be attached to adhesive layer 6a.

The paragraph starting on page 6, line 27, is amended as follows.

Fig. 10A is an alternative semiconductor package 60 within the present invention. Package 60 is the same as semiconductor package 1 of Fig. 3 except with respect to the fastening of heat sink 5 to the leadframe of the package. In package 60, adhesive layer 6a is omitted, and a small layer of encapsulate 4 is between heat sink 5 and the portion of inner leads 11 that overhangs heat sink 5. In package 60, heat sink 5 is supported in the central region of the package by encapsulated members that are separate from the leads. In particular, as shown in Fig. 10B, heat sink 5 is mechanically fastened to members that formerly were part of the leadframe used to make package 60. In this example, the members are four, down set, electrically isolated pseudo tie bars 26 that each extend diagonally from a corner of the package body towards chip 2. (Pseudo tie bars 26 are described in further detail below with respect to leadframe 20 of Fig. 6A.) A stake-like metal protrusion 61 extends from corner portions of [first] upper surface 5a of heat sink 5 through a hole in each pseudo tie bar 26. Each protrusion 61 is stamped or swaged against the respective pseudo tie bar 26 so as to form a metal to metal connection. In package 60, heat transmitted from chip 2 to heat sink 5 is believed to primarily dissipate by conduction through encapsulate 4 to inner leads 11.

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The paragraph starting on page 8, line 17, is amended as follows.

Figs. 7A and 7B [shows] show an alternative metal leadframe 10 within the present invention. Leadframe 10 includes features, discussed further below, that enable easier and superior molding of the package body, reduce lead bending, and facilitate wire bonding of the leads.

The paragraph starting on page 8, line 23, is amended as follows.

A plurality of metal leads (e.g., copper) extend radially around central opening 14. Each lead has an inner lead 11 that will be encapsulated and an outer lead (denoted by the reference numeral 12 in [Fig. 9] Figs. 9A and 9B) that will extend outside of the package body. An outer end of inner lead 11 is integrally connected to the inner side of a dam bar 19 (see Figs. 8, 9A, 9B) of leadframe 10. An opposite free end of each inner lead 11 is adjacent to central opening 14 (Fig. 7A). An inner end of outer lead 12 is integrally connected to an outer side of dam bar 19 [(Fig. 9)] (Figs. 9A and 9B). An opposite outer end (not shown) of each outer lead 12 is connected to an outer frame (not shown) of leadframe 10.

The paragraph starting on page 9, line 11, is amended as follows.

Fig. 8 is an enlarged plan view of portion "A" of Figs. 7A and 7B. Slot 18a is between at least one pair of inner leads 11 respectively arranged on opposite sides of a phantom line E that extends diagonally from one corner of the encapsulated region (denoted by dash lines 16) toward central opening 14 (see Figs. 7A and 7B). Slot 18a has a relatively wide portion outward of where adhesive layer 6a and heat sink 5 attach to inner leads 11, which allows resin to be introduced into the mold cavity through slot 18a without forming a turbulent or vortex flow. Slot 18a also has a relatively narrow portion inward of where adhesive layer 6a and heat sink 5 attach to inner leads 11. The wide portion of slot 18a has a width gl, and the narrower portion of slot 18a has a width g2. Preferably, the width gl is not more than 0.7 mm, and the width g2 is not more than 0.35 mm (while still being greater than the width of the space defined between adjacent inner leads 11).

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The paragraph starting on page 9, line 21, is amended as follows.

Leadframe 10 also is provided with an enlarged spade-shaped portion 15c at the outer end of slot 18a (Fig. 8). Enlarged spade-shaped portion 15c of leadframe 10 smoothly guides

the melted encapsulating resin toward slot 18a. A slot 18c extending around the side portions and/or rear portion of enlarged spade-shaped portion 15c facilitates the downward flow of the melted encapsulating resin.

The abstract starting on page 14, line 10, is amended as follows.

A semiconductor package having a fully encapsulated heat sink is disclosed, along with leadframes for making the package. A semiconductor chip is mounted on a surface of the heat sink. The heat sink is in an electrically insulative, thermally conductive connection with a plurality of leads that extend from a first end that overhangs the heat sink to an second end outside of the package body. A ring of a double sided adhesive tape attaches the heat sink to the overhanging portion of the leads. The heat sink design minimizes voids and damage caused by the encapsulation process, while maintaining thermal performance comparable to conventional, exposed heat sinks.

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ATTACHMENT B

This response amends Claims 1, 6, 7, 10, 12, 16, 17, and 20 as follows.

1. (Amended) A semiconductor package comprising:

a semiconductor chip;

a package body formed of a hardened encapsulant material;

a plurality of metal leads, wherein each lead is electrically connected to the chip; [and]

a flat metal plate fully encapsulated within said package body, wherein the chip is mounted on the plate and an encapsulated first portion of each of the leads overhangs a periphery of the plate[.]; and

a plurality of electrically isolated, encapsulated members, wherein each said member extends from a perimeter of the package body toward the plate and overhangs the periphery of the plate and is in a connection with the plate.

6. (Amended) The package of claim [5] 1, wherein each said member extends from a corner of the perimeter of said package body.

7. (Amended) The package of claim [5] 1, wherein the metal plate is connected to said members by an electrically insulative, thermally conductive adhesive layer.

10. (Amended) The package of claim 1, wherein [the plate is formed of metal, and] the metal plate has a thickness that is at least two times a thickness of said leads.

12. (Amended) A leadframe comprising:

a metal frame including a central region within the frame;

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a plurality of metal leads extending from a first end integral with the frame to a second end adjacent to the central region, wherein at least a plurality of the leads increase in width as those leads extend from the frame toward the central region; and

a flat metal plate supported in the central region, wherein a first portion of each said lead overhangs a [peripheral edge] periphery of said plate.

16. (Amended) The leadframe of claim 12, further comprising a plurality of [electrically isolated] members extending from said frame adjacent to said leads[;], wherein each said member overhangs the periphery of the plate and is in a connection with said plate.

17. (Amended) The leadframe of claim 16, wherein each said member extends from a corner of said frame.

20. (Amended) The leadframe of claim 16, wherein [the plate is formed of metal, and] the metal plate has a thickness that is at least two times a thickness of said leads.

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